

# NL27WZ125

## Dual Buffer with 3-State Outputs

The NL27WZ125 is a high performance dual noninverting buffer operating from a 1.65 V to 5.5 V supply.

### Features

- Extremely High Speed:  $t_{PD}$  2.6 ns (typical) at  $V_{CC} = 5$  V
- Designed for 1.65 V to 5.5 V  $V_{CC}$  Operation
- Over Voltage Tolerant Inputs and Outputs
- LVTTL Compatible – Interface Capability With 5 V TTL Logic with  $V_{CC} = 3$  V
- LVCMOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- 3–State OE Input is Active–Low
- Replacement for NC7WZ125
- Chip Complexity = 72 FETs
- Pb–Free Package is Available

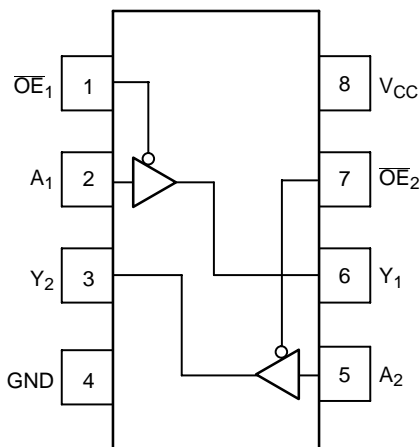


Figure 1. Pinout (Top View)

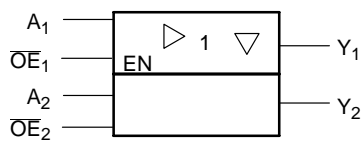
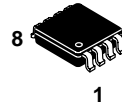


Figure 2. Logic Symbol



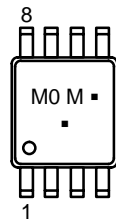
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US8  
US SUFFIX  
CASE 493

### MARKING DIAGRAM



M0 = Device Code  
M = Date Code\*  
▪ = Pb–Free Package

(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

### PIN ASSIGNMENT

| Pin | Function          |
|-----|-------------------|
| 1   | $\overline{OE}_1$ |
| 2   | $A_1$             |
| 3   | $Y_2$             |
| 4   | GND               |
| 5   | $A_2$             |
| 6   | $Y_1$             |
| 7   | $\overline{OE}_2$ |
| 8   | $V_{CC}$          |

### FUNCTION TABLE

| Input             |       | Output |
|-------------------|-------|--------|
| $\overline{OE}_n$ | $A_n$ | $Y_n$  |
| L                 | L     | L      |
| L                 | H     | H      |
| H                 | X     | Z      |

X = Don't Care  
n = 1, 2

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# NL27WZ125

## DEVICE ORDERING INFORMATION

| Device Order Number | Device Nomenclature     |                          |                       |            |                 |                | Package Type  | Tape and Reel Size† |
|---------------------|-------------------------|--------------------------|-----------------------|------------|-----------------|----------------|---------------|---------------------|
|                     | Logic Circuit Indicator | No. of Gates per Package | Temp Range Identifier | Technology | Device Function | Package Suffix |               |                     |
| NL27WZ125US         | NL                      | 2                        | 7                     | WZ         | 125             | US             | US8           | 178 mm, 3000 Unit   |
| NL27WZ125USG        | NL                      | 2                        | 7                     | WZ         | 125             | US             | US8 (Pb-Free) | 178 mm, 3000 Unit   |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

## MAXIMUM RATINGS

| Symbol        | Parameter   | Value                                  | Unit |
|---------------|---|--|------|
| $V_{CC}$      | DC Supply Voltage   | -0.5 to +7.0                           | V    |
| $V_I$         | DC Input Voltage  | -0.5 to +7.0                           | V    |
| $V_O$         | DC Output Voltage<br>Output in High Impedance State<br>Output in HIGH or LOW State                            | -0.5 to +7.0<br>-0.5 to $V_{CC} + 0.5$ | V    |
| $I_{IK}$      | DC Input Diode Current<br>$V_I < GND$   | -50                                    | mA   |
| $I_{OK}$      | DC Output Diode Current<br>$V_O < GND$  | -50                                    | mA   |
| $I_O$         | DC Output Sink Current  | ±50                                    | mA   |
| $I_{CC}$      | DC Supply Current per Supply Pin  | ±100                                   | mA   |
| $I_{GND}$     | DC Ground Current per Ground Pin  | ±100                                   | mA   |
| $T_{STG}$     | Storage Temperature Range   | -65 to +150                            | °C   |
| $T_L$         | Lead Temperature, 1 mm from Case for 10 Seconds   | 260                                    | °C   |
| $T_J$         | Junction Temperature under Bias   | +150                                   | °C   |
| $\theta_{JA}$ | Thermal Resistance (Note 1)   | 250                                    | °C/W |
| $P_D$         | Power Dissipation in Still Air at 85°C  | 250                                    | mW   |
| MSL           | Moisture Sensitivity  | Level 1                                |      |
| $F_R$         | Flammability Rating<br>Oxygen Index: 28 to 34   | UL 94 V-0 @ 0.125 in                   |      |
| $V_{ESD}$     | ESD Withstand Voltage<br>Human Body Model (Note 2)<br>Machine Model (Note 3)<br>Charged Device Model (Note 4) | > 2000<br>> 200<br>N/A                 | V    |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2-ounce copper trace with no air flow.
2. Tested to EIA/JESD22-A114-A.
3. Tested to EIA/JESD22-A115-A.
4. Tested to JESD22-C101-A.

## RECOMMENDED OPERATING CONDITIONS

| Symbol              | Parameter  | Min         | Max           | Unit |
|---------------------|--|-------------|---------------|------|
| $V_{CC}$            | Supply Voltage<br>Operating<br>Data Retention Only   | 1.65<br>1.5 | 5.5<br>5.5    | V    |
| $V_I$               | Input Voltage (Note 5)   | 0           | 5.5           | V    |
| $V_O$               | Output Voltage (HIGH or LOW State)   | 0           | 5.5           | V    |
| $T_A$               | Operating Free-Air Temperature   | -40         | +85           | °C   |
| $\Delta t/\Delta V$ | Input Transition Rise or Fall Rate<br>$V_{CC} = 2.5 V \pm 0.2 V$<br>$V_{CC} = 3.0 V \pm 0.3 V$<br>$V_{CC} = 5.0 V \pm 0.5 V$ | 0<br>0<br>0 | 20<br>10<br>5 | ns/V |

5. Unused inputs may not be left open. All inputs must be tied to a high- or low-logic input voltage level.

# NL27WZ125

## DC ELECTRICAL CHARACTERISTICS

| Symbol           | Parameter   | Condition  | V <sub>CC</sub><br>(V)                                 | T <sub>A</sub> = 25°C  |  |  | -40°C ≤ T <sub>A</sub> ≤ 85°C                                   |  | Unit |
|------------------|---|--|--|--|--|--|---|--|------|
|                  |   |  |  | Min  | Typ  | Max  | Min   | Max  |      |
| V <sub>IH</sub>  | High-Level Input Voltage  |  | 1.65<br>2.3 to 5.5                                     | 0.75 V <sub>CC</sub><br>0.7 V <sub>CC</sub>                      |  |  | 0.75 V <sub>CC</sub><br>0.7 V <sub>CC</sub>                     |  | V    |
| V <sub>IL</sub>  | Low-Level Input Voltage   |  | 1.65<br>2.3 to 5.5                                     |  |  | 0.25 V <sub>CC</sub><br>0.3 V <sub>CC</sub>      |   | 0.25 V <sub>CC</sub><br>0.3 V <sub>CC</sub>      | V    |
| V <sub>OH</sub>  | High-Level Output Voltage<br>V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> | I <sub>OH</sub> = 100 μA<br>I <sub>OH</sub> = -3 mA<br>I <sub>OH</sub> = -8 mA<br>I <sub>OH</sub> = -12 mA<br>I <sub>OH</sub> = -16 mA<br>I <sub>OH</sub> = -24 mA<br>I <sub>OH</sub> = -32 mA | 1.65 to 5.5<br>1.65<br>2.3<br>2.7<br>3.0<br>3.0<br>4.5 | V <sub>CC</sub> - 0.1<br>1.29<br>1.9<br>2.2<br>2.4<br>2.5<br>3.8 | V <sub>CC</sub><br>1.52<br>2.1<br>2.4<br>2.7<br>2.5<br>4.0 |  | V <sub>CC</sub> -0.1<br>1.29<br>1.9<br>2.2<br>2.4<br>2.3<br>3.8 |  | V    |
| V <sub>OL</sub>  | Low-Level Output Voltage<br>V <sub>IN</sub> = V <sub>IL</sub>                     | I <sub>OL</sub> = 100 μA<br>I <sub>OL</sub> = 3 mA<br>I <sub>OL</sub> = 8 mA<br>I <sub>OL</sub> = 12 mA<br>I <sub>OL</sub> = 16 mA<br>I <sub>OL</sub> = 24 mA<br>I <sub>OL</sub> = 32 mA       | 1.65 to 5.5<br><br>2.3<br>2.7<br>3.0<br>3.0<br>4.5     |  | 0.08<br>0.20<br>0.22<br>0.28<br>0.38<br>0.42               | 0.1<br>0.24<br>0.3<br>0.4<br>0.4<br>0.55<br>0.55 |   | 0.1<br>0.24<br>0.3<br>0.4<br>0.4<br>0.55<br>0.55 | V    |
| I <sub>IN</sub>  | Input Leakage Current   | V <sub>IN</sub> = V <sub>CC</sub> or GND   | 5.5  |  |  | ±0.1   |   | ±1.0   | μA   |
| I <sub>OFF</sub> | Power Off Leakage Current   | V <sub>OUT</sub> = 5.5 V<br>V <sub>IN</sub> = 5.5 V  | 0  |  |  | 1.0  |   | 10   | μA   |
| I <sub>CC</sub>  | Quiescent Supply Current  | V <sub>IN</sub> = V <sub>CC</sub> or GND   | 5.5  |  |  | 1.0  |   | 10   | μA   |
| I <sub>OZ</sub>  | 3-State Output Leakage  | V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>0V ≤ V <sub>OUT</sub> ≤ 5.5 V  | 2.3 to 5.5   |  |  | ±0.5   |   | ±5   | μA   |

## AC ELECTRICAL CHARACTERISTICS (t<sub>R</sub> = t<sub>F</sub> = 3.0 ns)

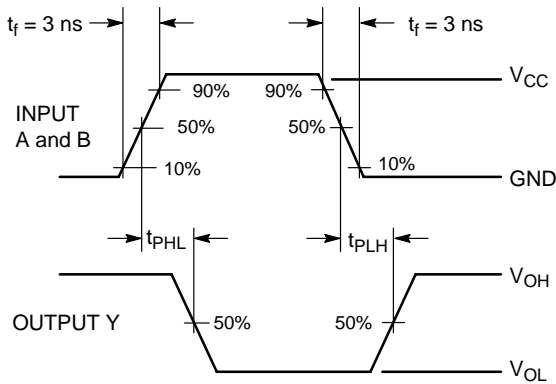
| Symbol                                 | Parameter  | Condition  | V <sub>CC</sub><br>(V)  | T <sub>A</sub> = 25°C |     |           | -40°C ≤ T <sub>A</sub> ≤ 85°C |           | Unit |
|--|--|--|-------------------------|-----------------------|-----|-----------|-------------------------------|-----------|------|
|  |  |  |                         | Min                   | Typ | Max       | Min                           | Max       |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub>   | Propagation Delay<br>AN to YN<br>(Figures 3 and 4) | R <sub>L</sub> = 1 MΩ    C <sub>L</sub> = 15 pF  | 1.8 ± 0.15<br>2.5 ± 0.2 | 2.0<br>1.0            |     | 12<br>7.5 | 2.0<br>1.0                    | 13<br>8   | ns   |
|  |  | R <sub>L</sub> = 1 MΩ    C <sub>L</sub> = 15 pF  | 3.3 ± 0.3               | 0.8                   |     | 5.2       | 0.8                           | 5.5       |      |
|  |  | R <sub>L</sub> = 500 Ω    C <sub>L</sub> = 50 pF |                         | 1.2                   |     | 5.7       | 1.2                           | 6.0       |      |
|  |  | R <sub>L</sub> = 1 MΩ    C <sub>L</sub> = 15 pF  | 5.0 ± 0.5               | 0.5                   |     | 4.5       | 0.5                           | 4.8       |      |
|  |  | R <sub>L</sub> = 500 Ω    C <sub>L</sub> = 50 pF |                         | 0.8                   |     | 5.0       | 0.8                           | 5.3       |      |
| t <sub>OSLH</sub><br>t <sub>OSSL</sub> | Output to Output Skew<br>(Note 6)                  | R <sub>L</sub> = 500 Ω    C <sub>L</sub> = 50 pF | 3.3 ± 0.3               |                       |     | 1.0       |                               | 1.0       | ns   |
|  |  | R <sub>L</sub> = 500 Ω    C <sub>L</sub> = 50 pF | 5.0 ± 0.5               |                       |     | 0.8       |                               | 0.8       |      |
| t <sub>PZH</sub><br>t <sub>PZL</sub>   | Output Enable Time<br>(Figures 5, 6 and 7)         |  | 1.8 ± 0.15<br>2.5 ± 0.2 | 3.0<br>1.8            |     | 14<br>8.5 | 3.0<br>1.8                    | 15<br>9.0 | ns   |
|  |  |  | 3.3 ± 0.3               | 1.2                   |     | 6.2       | 1.2                           | 6.5       |      |
|  |  |  | 5.0 ± 0.5               | 0.8                   |     | 5.5       | 0.8                           | 5.8       |      |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub>   | Output Enable Time<br>(Figures 5, 6 and 7)         |  | 1.8 ± 0.15<br>2.5 ± 0.2 | 2.5<br>1.5            |     | 12<br>8.0 | 2.5<br>1.5                    | 13<br>8.5 | ns   |
|  |  |  | 3.3 ± 0.3               | 0.8                   |     | 5.7       | 0.8                           | 6.0       |      |
|  |  |  | 5.0 ± 0.5               | 0.3                   |     | 4.7       | 0.3                           | 5.0       |      |

6. Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. This specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t<sub>OSSL</sub>) or LOW-to-HIGH (t<sub>OSLH</sub>); parameter guaranteed by design.

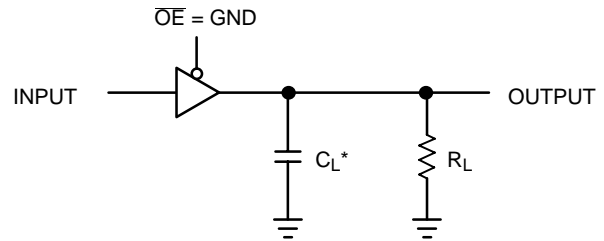
**CAPACITIVE CHARACTERISTICS**

| Symbol    | Parameter                                 | Condition  | Typical  | Unit |
|-----------|---|--|----------|------|
| $C_{IN}$  | Input Capacitance                         | $V_{CC} = 5.5\text{ V}, V_I = 0\text{ V or }V_{CC}$  | 7.0      | pF   |
| $C_{OUT}$ | Output Capacitance                        | $V_{CC} = 5.5\text{ V}, V_I = 0\text{ V or }V_{CC}$  | 7.0      | pF   |
| $C_{PD}$  | Power Dissipation Capacitance<br>(Note 7) | 10 MHz, $V_{CC} = 3.3\text{ V}, V_I = 0\text{ V or }V_{CC}$<br>10 MHz, $V_{CC} = 5.5\text{ V}, V_I = 0\text{ V or }V_{CC}$ | 18<br>27 | pF   |

7.  $C_{PD}$  is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation:  $I_{CC(OPR)} = C_{PD} \cdot V_{CC} \cdot f_{in} + I_{CC}$ .  $C_{PD}$  is used to determine the no-load dynamic power consumption;  $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$ .

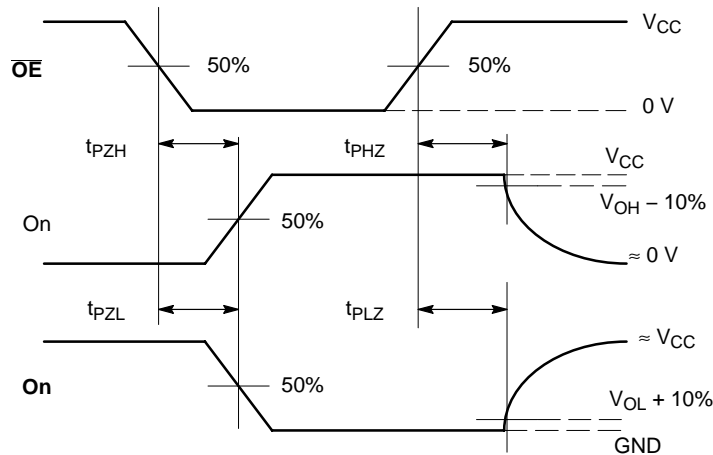


**Figure 3. Switching Waveform**

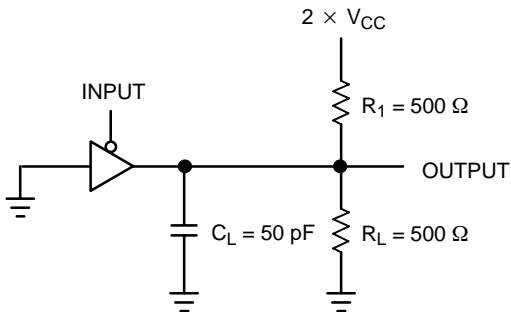


\*Includes all probe and jig capacitance.  
A 1 MHz square input wave is recommended for propagation delay tests.

**Figure 4. TPLH or TPL**

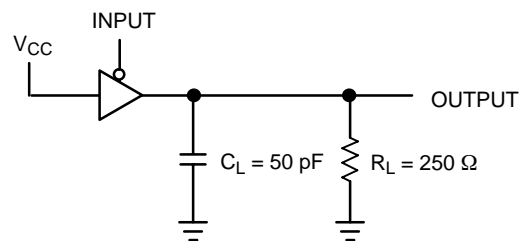


**Figure 5. AC Output Enable and Disable Waveform**



A 1 MHz square input wave is recommended for propagation delay tests.

**Figure 6. TPZL or TPL**



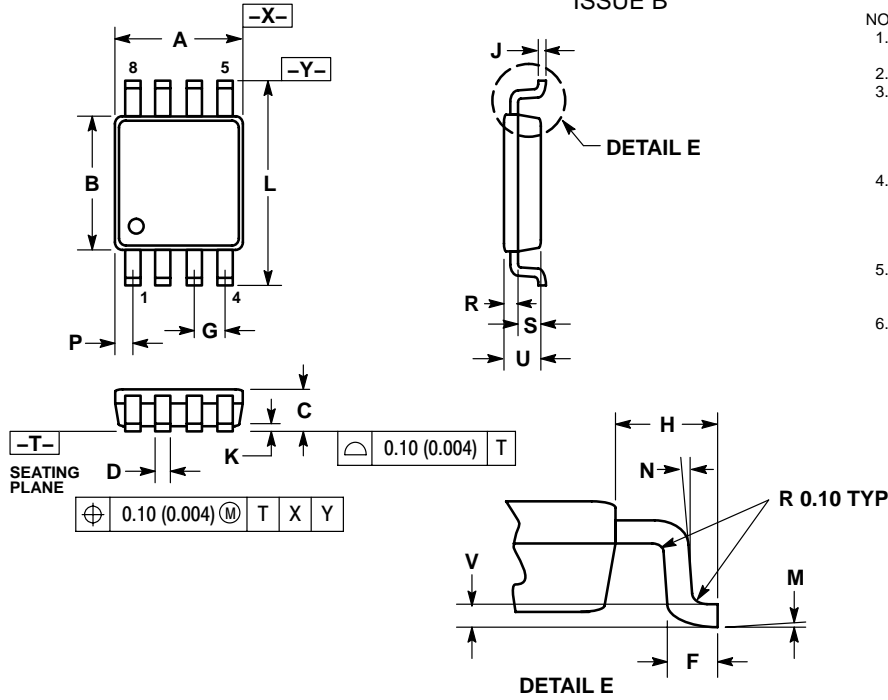
A 1 MHz square input wave is recommended for propagation delay tests.

**Figure 7. TPZH or TPHZ**

# NL27WZ125

## PACKAGE DIMENSIONS

US8  
US SUFFIX  
CASE 493-02  
ISSUE B

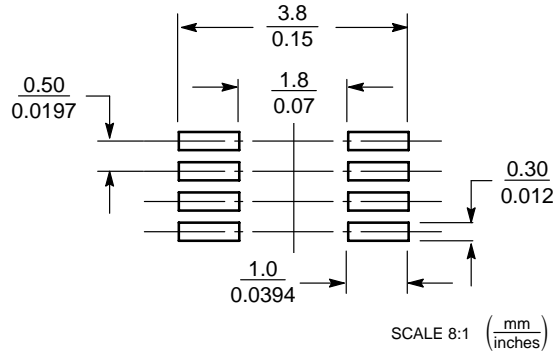


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION "A" DOES NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURR. MOLD FLASH, PROTRUSION AND GATE BURR SHALL NOT EXCEED 0.140 MM (0.0055") PER SIDE.
4. DIMENSION "B" DOES NOT INCLUDE INTER-LEAD FLASH OR PROTRUSION. INTER-LEAD FLASH AND PROTRUSION SHALL NOT EXCEED 0.140 (0.0055") PER SIDE.
5. LEAD FINISH IS SOLDER PLATING WITH THICKNESS OF 0.0076-0.0203 MM. (300-800 °).
6. ALL TOLERANCE UNLESS OTHERWISE SPECIFIED ±0.0508 (0.0020").

| DIM | MILLIMETERS |          | INCHES    |           |
|-----|-------------|----------|-----------|-----------|
|     | MIN         | MAX      | MIN       | MAX       |
| A   | 1.90        | 2.10     | 0.075     | 0.083     |
| B   | 2.20        | 2.40     | 0.087     | 0.094     |
| C   | 0.60        | 0.90     | 0.024     | 0.035     |
| D   | 0.17        | 0.25     | 0.007     | 0.010     |
| F   | 0.20        | 0.35     | 0.008     | 0.014     |
| G   | 0.50 BSC    |          | 0.020 BSC |           |
| H   | 0.40 REF    |          | 0.016 REF |           |
| J   | 0.10        | 0.18     | 0.004     | 0.007     |
| K   | 0.00        | 0.10     | 0.000     | 0.004     |
| L   | 3.00        | 3.20     | 0.118     | 0.126     |
| M   | 0°          | 6°       | 0°        | 6°        |
| N   | 5°          | 10°      | 5°        | 10°       |
| P   | 0.23        | 0.34     | 0.010     | 0.013     |
| R   | 0.23        | 0.33     | 0.009     | 0.013     |
| S   | 0.37        | 0.47     | 0.015     | 0.019     |
| U   | 0.60        | 0.80     | 0.024     | 0.031     |
| V   |             | 0.12 BSC |           | 0.005 BSC |

### SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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